**Supplemental tables and figures for:**

# Root traits of cover crops and carbon inputs in an organic grain rotation

Joseph Pierre Amsilia,b, Jason P. Kayea

 a Department of Ecosystem Science and Management, Pennsylvania State University, 116 ASI,

University Park, PA, 16802, USA.

b Section of Crop and Soil Sciences, School of Integrative Plant Science, Cornell University, 1001 Bradfield Hall, Ithaca, NY, 14853, USA.

\*Corresponding author

Email address: jpa28@cornell.edu (Joseph Pierre Amsili)

Phone number: 607 592-1646

Fax number: 607 255-2644

**Table S1** Meancover crop root biomass carbon (kg C ha-1) at each depth interval (0-5 cm, 5-20 cm, 20-40 cm) in fall 2016 and spring 2017. Mean root C results represent the average of in-row and between-row roots. Superscript letters indicate significance differences in root C among cover crop treatments at different depth intervals for fall 2016 and spring 2017 (P<0.05). Values in parentheses are 1 standard error of the mean.

|  |  |  |
| --- | --- | --- |
| Depth interval | Fall 2016 |  |
| 5 spp. mix | Canola | Crimson Clover | Triticale |
| 0-5 cm roots | 203b (18) | 274ab (41) | 104c (5) | 333a (13) |
| 5-20 cm roots  | 204 (58) | 301 (73) | 176 (12) | 316 (39) |
| 20-40 cm roots | 93 (28) | 76 (16) | 93 (8) | 136 (23) |
|  | Spring 2017 |  |  |
|  | 5 spp. mix | Canola | Crimson Clover | Triticale |
| 0-5 cm roots | 373a (19) | 362a (65) | 140b (17) | 441a (26) |
| 5-20 cm roots  | 278b (30) | 220b (48) | 218b (24) | 436a (10) |
| 20-40 cm roots | 86b (7) | 112b (10) | 101b (15) | 201a (25) |

**Table S2** Repeated measures mixed model analysis of cover crop R:S ratio. Fixed effects were cover crop, season, and cover crop by season interactions. Block was a random effect.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Effect | Sum Sq | Mean Sq | df | F | Pr(>F) |
| Cover crop | 0.847 | 0.282 | 3,18 | 30.42 | <.0001 |
| Season | 0.060 | 0.060 | 1,3 | 7.40 | 0.0726 |
| Cover crop x Season | 0.178 | 0.059 | 3,18 | 6.41 | 0.0038 |

**Table S3** Between-row root carbon (kg C ha-1) at each depth interval (0-5 cm, 5-20 cm, 20-40 cm) in fall 2016 and spring 2017. Superscript letters indicate significance differences in between-row root biomass C at different depth intervals for fall 2016 and spring 2017 (P<0.05). Values in parentheses are 1 standard error of the mean.

|  |  |  |
| --- | --- | --- |
| Depth interval | Fall 2016 |  |
| 5 spp. mix | Canola | Crimson Clover | Triticale |
| 0-5 cm roots | 63b (12) | 51b (2) | 38b (3) | 238a (49) |
| 5-20 cm roots  | 97b (17) | 140b (31) | 105b (28) | 316s (52) |
| 20-40 cm roots | 76ab (28) | 50b (8) | 92ab (18) | 137a (25) |
|  | Spring 2017 |  |  |
|  | 5 spp. mix | Canola | Crimson Clover | Triticale |
| 0-5 cm roots | 373a (19) | 362a (65) | 140b (17) | 441a (26) |
| 5-20 cm roots  | 278b (30) | 220b (48) | 218b (24) | 436a (10) |
| 20-40 cm roots | 86b (7) | 112b (10) | 101b (15) | 201a (25) |

**Fig. S1** The percent of total root carbon that was found in the between-row space at each depth interval (0-5 cm, 5-20 cm, 20-40 cm) in fall 2016 and spring 2017. Superscript letters indicate significance differences in the % of root carbon in the between-row space at different depth intervals for fall 2016 and spring 2017 (P<0.05).

**Fig. S2** Cover crop carbon inputs for the 2015-2016, 2016-2017 winter annual cover cropping windows. Carbon inputs were partitioned into shoot and root inputs.

**Table S4** Species composition of 5 spp. mix sampling quadrats for root study and field scale aboveground biomass determination.

|  |  |  |
| --- | --- | --- |
| Cover crop | Fall 2016 | Spring 2017 |
|  | Root quadrats | Field scale quadrats | Root quadrats | Field scale quadrats |
| CC | 46 % | 41 % | 48 % | 45 % |
| CA | 45 % | 44 % | 38 % | 42 % |
| TR | 5 % | 6 % | 13 % | 11 % |
| Pea | 4 % | 7 % | 1 % | 1 % |

**Table S****5** Aboveground shoot carbon residues (kg C ha-1) at different sampling dates. On 5/1/17, living tissues and dead residues were separated. All other dates show living and dead residues combined.

|  |  |
| --- | --- |
| Treatment | Sampling date |
|  | 11/1/16 | 2/22/17 | 4/10/17 | 5/1/17 living | 5/1/17 residues |
| 5spp Mix | 1,282 | 1,512 | 1,264 | 2,183 | 106 |
| Canola | 990 | 599 | 644 | 1,379 | 36 |
| Crimsonclover | 1,295 | 1,813 | 1,059 | 1,155 | 241 |
| Triticale | 751 | 982 | 1,142 | 1,323 | 212 |

**Fig. S3** Total shoot carbon (kg C ha-1) at different sampling dates. Samples include living biomass and residues.



**Fig. S4** % SOM differences between the beginning and end of a full three-year crop rotation. Sampling time was right at cover crop termination in early May for both beginning and end sampling dates.